THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

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THE INFRINGEMENT OF PATENT RIGHTS.

SEVERAL of those unfortunate patent right litigations which every now and again mar the progress of invention are now impending in the electrical world. The most interesting of these is probably the long-mooted struggle between the Western Union Telegraph Company, owning the Edison and Elisha Gray telephone patents, and the Bell Telephone Company, owning the patent rights of Alexander Graham Bell. According to our contemporary, the *Iron Age*, "nearly a hundred patents embodying supposed improvements in telephones have been issued, and more than a dozen interference suits are now pending before the Patent Office, brought in the names of as many patentees. The general public knows only of the business rivalry between the Bell Telephone Company on the one hand, and the Western Union Company, owning the Edison patents, on the other; but before the courts and the Patent Office the controversy takes a character entirely different. The merits of the case are very difficult to reach, and seem not to be understood even by experts in electricity or patent law. So many fine points in electrical science and in patent law—the most evasive and crooked of all branches of jurisprudence—enter into the matter that one becomes involved from the outset in a labyrinth of technicalities so dense that a just and intelligible solution seems to be an impossibility. The interference cases are set for a hearing some time next February, and the time meanwhile is being taken advantage of by the counsel to take testimony bearing upon the cases. Stripped of side issues, the immediate controversy appears to be narrowed down to the question of priority in the application of the principle of the undulatory current to the transmission of spoken words." The *Iron Age* further states that Gray's July, 1875, patent, re-issued on January 28, 1879, forms the foundation of the counter claim of the Western Union against the Bell Telephone Company, which reposes its rights on Professor Bell's patent filed on February 14, 1876.

We also understand that the Edison Telephone Company of London, which, by the way, is an English company, intends proceeding against the Bell Telephone Company for employing Blake's microphone transmitter, illustrated in a recent number of the TELEGRAPHIC JOURNAL (Oct. 1st).

Another very important case on the cards is that brought by Mr. J. B. Stearns against Mr. John Muirhead for alleged infringement of his duplex patents. Every electrician knows that the first practical successes in applying the duplex system of telegraphy on submarine cables were achieved by Muirhead's inventions, after Stearns' system had been tried and found wanting, just as the first practical transmission of speech was achieved by Bell's telephone, while Gray's telephone was yet inadequate; but both of the defeated American inventors maintain that their "thunder has been stolen."

The main cause of these ruinous litigations attending so many great inventions, is not so much a love of right and justice as a greedy lust for money. When an invention proves to be successful and the rewards of success flow in, there are always plenty hungering after a share of the spoil, and ready to put forward their claims. Now, it is almost impossible to find an invention which is wholly original; one man's ideas suggest those of another man; one man improves on the work of his predecessor; and it often happens that the improvement in question makes all the difference between success and failure. Each advance is, however, a distinct invention, and the whole question comes to be whether it is so notable as to be regarded as original and valid *in patent law*. A sound knowledge of the technicalities of the subject in dispute and of the law of patents is, therefore, necessary to decide whether or not there is a true infringement of patent rights.

Going to law is, in our opinion, a deplorable method of settling such disputes. Judge, counsel, and jury are too often ignorant of any branch of science and utterly incompetent to decide the point at issue; and the result is that fortunes are squandered to fill the pockets of legal sharks, personal feelings are embittered beyond expression, and the dignity of invention is disgraced by mean motives and low suspicions, without any just decision being arrived at after all.

It is not an agreeable sight to see inventors publicly wrangling over the products of their genius, and preying upon each other like so many Kilkenny cats. By far the better plan would be to endeavour to come to some private arrangement whereby an amicable and just compromise could be effected. If one inventor's plans have been simply improved, however markedly, by another inventor, and there is a real and true evidence of generic relationship between them, then the prior inventor, even though his work is unsuccessful, is entitled to recognition,

for his invention was the germ of the more feasible one, and some portion of the profits may well be accorded him. On the other hand, if there is a specific distinction between two inventions, even although one of these may have *suggested* the other, there can be no legitimate claims between them. To further a peaceful mode of settlement, the question should be submitted to an expert in the patent law and the technical subject in hand for his adjudication. This plan may, of course, be objected to on the score of biassed judgment, bribery, &c., but with proper care these are evils which can be minimised, and, at least, they are of far smaller importance than the evils of trial in court. The recent decision of Sir William Thomson, on the improved process for the dephosphorisation of iron, is a case in point; and we think it would be well if these outstanding electrical disputes were to be settled in a similar way. Arbitration, and not trial at law, is the proper process.

NEW RESEARCHES ON THE THEORY OF THE MICROPHONE.

By DR. JULIAN OCHOSWICZ.

Two distinct hypotheses have been put forward to explain the phenomena which occur in the ingenious discovery of Mr. Hughes. The one, exclusively molecular, supposes dilatations and contractions of the molecules in certain partially conducting bodies, to take place under the influence of sonorous vibrations, in the microphone itself. *Changes of density* correspond to the increase or decrease of the resistance of the circuit, and, consequently, to a proportional production of sounds. This hypothesis bears a certain analogy to the phenomena which take place in selenium under the influence of light and radiant heat.

The other, partly molecular and partly mechanical, rests upon the discovery, made some time ago, by M. du Moncel, and according to which the increase and decrease of resistance are due to changes of pressure in the electrical points of contact. These changes being produced by the pressure of the vibrating air, there results an equivalence of causes and effects.

In basing my theories on experiments made with a very great number of microphones, since the first appearance of this discovery, I shall endeavour to prove that, if one of these hypotheses is entirely erroneous, the other is only superficially true.

In the first place:

1. When the carbon rod is immovably fixed by any cement, wax for example, without submitting it to any pressure, the microphone remains inert under the most powerful sonorous effects. This would be impossible if it acted by molecular action only and not mechanical.

2. The microphone can be placed in a tube of glass, lightly suspended by means of a fine wire, and the air exhausted in the tube without affecting its microphonic effects. It is evident that, in this case, the waves of air can have no influence upon the density of the carbon, they only act mechanically by shaking the whole apparatus.

3. It is impossible to construct a microphone of a single piece of solid carbon, presenting firm contacts, which do not prevent molecular influences, but which render impossible the action of sonorous waves, of contacts, and of shakes, on the current which traverses the carbon.

It appears to me, then, that we have these sufficient reasons for entirely rejecting the exclusive molecular theory.

Again:

1. The lateral pressure exercised on a compact electric conductor (metal, carbon, &c.) placed in a telephone, does not produce any microphonic action.

2. A longitudinal pressure exercised on the rod of a microphone by means of a thumb-screw, can modify within certain limits without altering the action of the apparatus. This is only the *timbre* which alters the intonation. But the same effect can be obtained without change of pressure, by the simple fact of changing the points of contact. If the pressure is augmented, the apparatus loses its sensibility at the same time that it loses its faculty of vibrating mechanically; but the single fact of an augmentation of pressure has no connection with any microphonic phenomenon. This experiment relates to a microphone with a membrane.

3. Apparatus can be constructed in which the pressure remains the same, and which nevertheless acts as a microphone. (See figure.) It is hardly rational therefore to consider pressure as the essential cause of microphonic phenomena.

It is, however, an accidental cause, for when the sonorous waves strike the movable part of the apparatus, the pressure which it exercises on the support changes; but this is not from the fact of the pressure causing the differences of resistance; it is from another fact, often parallel to the first, but which differs from it.

In order to understand this better, let us consider the apparatus in its simplest form, as shown by fig. 1.

FIG. 1.

Two short pieces of wire, in circuit with the microphone and telephone, are stretched across one another as shown; the current passes at the point of crossing. It is *at this point only* that the microphonic action takes place. When one of the wires is caused to vibrate from any cause, a noise or very strong musical sound fills the room in which the telephone

is placed. If the wires are good conductors the action of the apparatus has two phases: the current passes when one wire touches the other, it does not pass when the reverse is the case. There is then a *simple and complete interruption of the current*, and, in consequence, this microphone, like the transmitter of Reiss, like the singer of Mr. Pollard, &c., can only transmit simple sounds. This first category embraces all the microphones in which the contact is effected at a single point. I have obtained better results of the kind with a bladder membrane and sharp point. The electric communication was ensured by a little strip of tinfoil glued on the membrane. With a small bichromate battery the tune could be heard all over a room. Strictly speaking, there is in these simple apparatus certain graduations of action between the limits of full intensity and of complete rupture of the current, and one can understand that sometimes the *interruption is only partial. It is then the alteration of the points of contact* which plays here the principal *rôle*. *The intensity* of the sounds depends upon the greater or less number of these points; the number of successive interruptions of the same contacts determines their *pitch*, and the nature of the changes their *quality*. In fact, the successive and simultaneous combinations, periodic or non-periodic, of all these changes determine their *articulation*. It is sufficient to compare the traces of the words in the phonautograph, the logograph, and the phonograph to convince oneself that it is, in these apparatus, only a reduction of *quality* to quantity. I am even inclined to believe that this reduction is very simple, and that a series of combinations in times and in spaces of *three material points of contact* is sufficient to produce an equivalent to all our articulate sounds. It would be difficult to relate all the experiments and inferences which have led me to this supposition, but I give them for what they are worth, and now pass to the third category.

The principle of the change in the number of points of contact caused by pressure allows us to consider the different resistances of the microphonic circuit, and explains the action of the majority of microphones, but it does not explain all.

It is possible to construct, in fact, microphones in which no alteration of pressure will produce a variation in the numbers of points of contact, but which, nevertheless, work well.

FIG. 2.

Suppose a little cylinder of carbon, *a* (fig. 2), fixed horizontally to a membrane, M M, and sliding on another small cylinder of carbon, *b*, movable about its axis. If the cylindrical form of these two pieces is perfect the pressure and the number of points of contact remain the same. If this is not so, as would practically be the case, then the *rôle* played is different; it is *the* length of the route traversed by the current in the bad conductor. Whilst the membrane vibrates, its distance from the carbon *b* diminishes or increases, and there is then a change in the number of the points of resistance crossed.

It is this class of apparatus to which belong the liquid telephone transmitters of Gray, Bell, and Palet, where the change of resistance in the circuit results from a layer of liquid more or less thick, which is to be traversed by the current.

It is very difficult to separate the two principles one from the other, but it is possible to determine the preponderance of the one or the other, or still better their parallelism. Suppose, for example, that the two cylinders of carbon, *a* and *b*, were replaced by two plates of the same material, and that *b* remains immovable, the two actions would be equal and opposite. The same complication presents itself in the microphonic transmitter of M. Righi, where the metallic disc of the membrane plunges in the powder of plumbago mixed with powdered silver.—*La Lumière Electrique.*

ARBORESCENT ELECTRIC DISCHARGES.

IN former numbers of the TELEGRAPHIC JOURNAL we have illustrated the interesting experiments of M. Gaston Planté on the form of the sparks obtained from his rheostatic machine of 80 condensers under various conditions. More of these have recently been published by him in the second part of his work on *Recherches sur L'Electricité*,* and we are now enabled by his courtesy to place before our readers the most novel of them.

ARBORESCENCES.—When the poles of the machine are laid on a plate of insulating matter sprinkled with powder of sulphur the sparks are much elongated, and they also present tree-like figures when the excess of sulphur is raised by slight shocks given to the plate. Fig. 1 shows one of these figures, full size, obtained from a spark 0·15 metres long.

These effects explain the patterns of vegetation sometimes seen on persons struck by lightning; they are merely the branching of the lightning track.

Fig. 2 represents the furrow produced in the sulphur by a spark before giving the shocks which cause the arborescences. It will be observed that the width of the furrow is greater on the side of the positive pole. On the rays round the positive pole the sulphur is heaped up, while the traces round the negative pole correspond to the negative features seen in fig. 1.

* Published by A. Fourneau, 18, Rue de la Sorbonne, Paris.

FIG. 1.

FIG. 2.

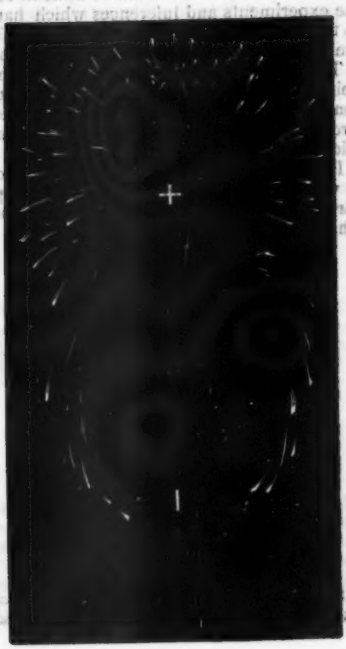

FIG. 5.

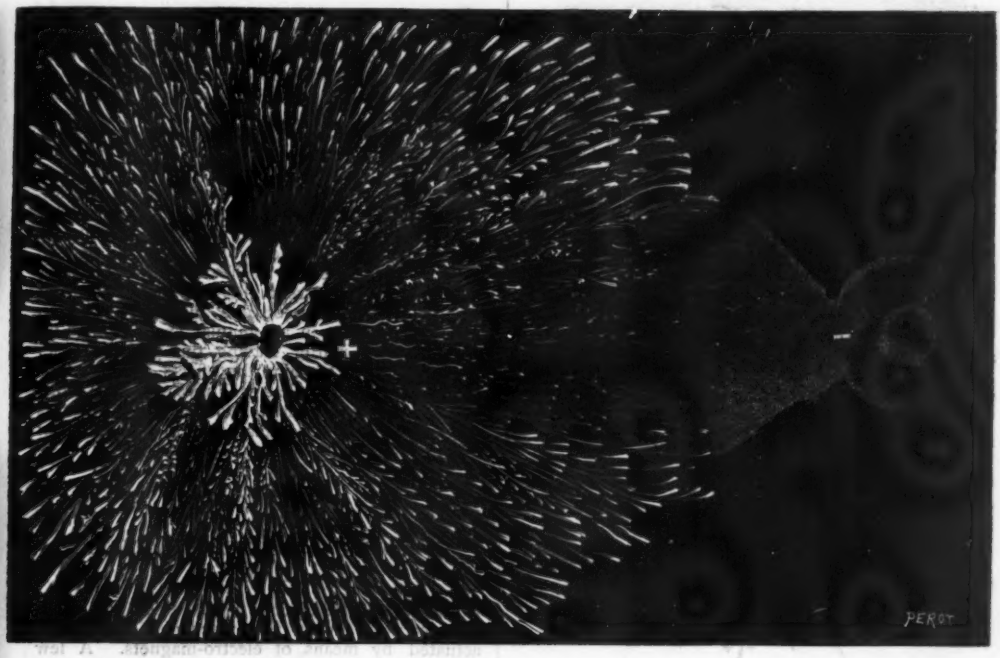

FIG. 3.

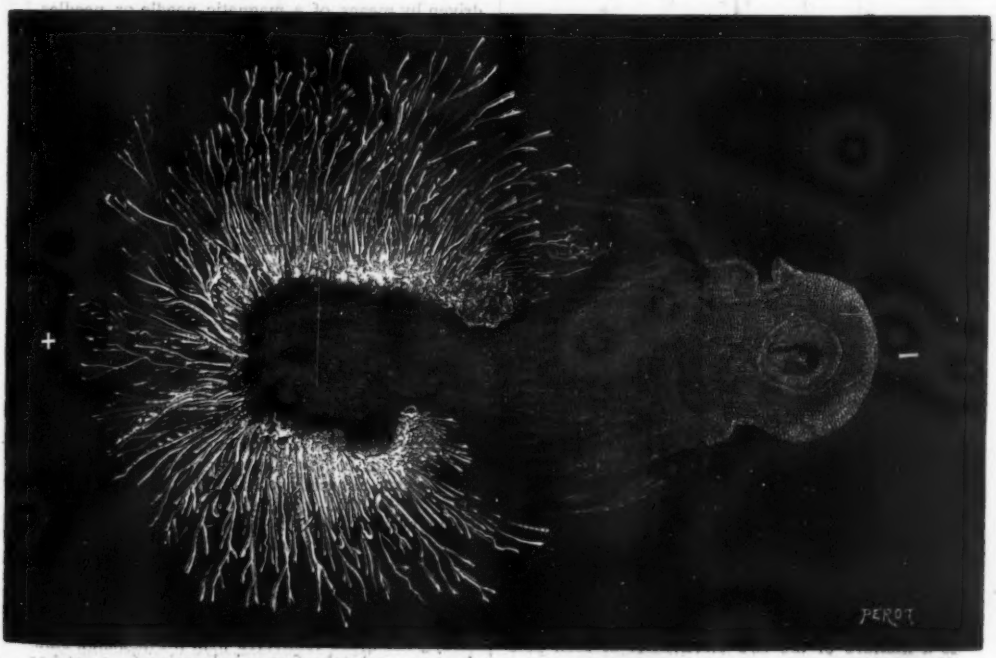

FIG. 4.

LICHTENBERG'S FIGURES.—On a surface of pure resin shed with powder of sulphur and red lead the sparks give beautiful Lichtenberg figures of a different kind, which when fixed on gummed paper constitute valuable aids to the study of the electric discharge. These are illustrated by figs. 3 and 4.

The difference between the effect produced by the brush discharge and sparks is very marked.

When the distance between the points of the excitor is too great for the spark to pass, and a brush discharge only appears, the electric movement of the ponderable matter leaving the negative pole, manifested by the red lead which adheres to the resin, does not extend to the positive pole. This last pole only presents traces of red dust in the middle of the crown of sulphur, with diverging rays, which surrounds it (fig. 3).

But if the spark has passed, this crown is open and the interior is filled with red-lead powder, showing that the electric movement leaving the negative pole extends even to the positive pole (fig. 4).

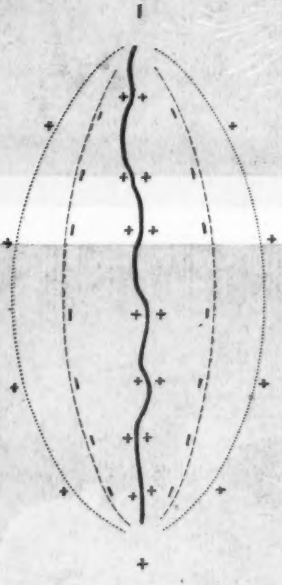

FIG. 6

In the case of the spark the distribution of negative electricity presents a curious crab-shaped appearance (owl-shaped would, we think, be a better term); in the case of the brush it resembles more or less the form of a polype having its tentacles directed towards the positive pole without attaining to it.

On the other hand, when the spark passes one recognises sometimes, by the traces of sulphur round the negative pole, that the emission of positive electricity extends itself to that pole. There is a mixture of the two electricities at each pole (fig. 5).

This observation explains how in the circuit currents of very high tension, which approach closely to a series of continuous static discharges, can produce complete decomposition of water at each pole, and consequently a mixture of oxygen and hydrogen.

One remarks also that the movement leaving the positive pole envelops externally, like a sheaf of rockets, the negative movement (figs. 3, 4, 5).

Often one perceives at the same time an interior flow of positive electricity round the line of the spark, besides the positive exterior enveloping current, and between the two the negative electric current, which seems as if sucked up (*aspirée*) by the positive current (fig. 6). The negative electricity of the ponderable matter which she takes along moves in an annular space formed by the electrified matter leaving the positive pole. This observation explains the effects of suction or ascension of water that we have obtained with currents of high tension. Do we not also in this phenomenon find the explanation of the uprise of water in the cloudy interior of a waterspout?

SHEPHERD'S ELECTRO-MAGNETIC CLOCK.

IN the majority of electric clocks which are *driven* by electrical means the mechanism has been actuated by means of electro-magnets. A few years ago Sir Charles Wheatstone invented a system of electric clocks in which the mechanism was driven by means of a magnetic needle or needles, which revolved continuously within an ordinary galvanometer coil, the driving power being an electro-magnetic current induced by the movement of a pendulum driven by a weight. This system failed, after repeated trials, in consequence of the magnetic current produced being insufficient to overcome the inevitable irregularities which tend to cause a clock to stop if sufficient margin of power is not allowed to overcome them. Mr. Charles Shepherd has recently devised a system of electric clocks in which the driving mechanism is somewhat similar to that employed in the clocks of Wheatstone referred to, but in which the driving power is a current from a battery. The battery not only drives the clock mechanism but also keeps the regulating pendulum in motion. The means by which this latter is effected are shown by figs. 1 and 2. In this arrangement 16, 17, 18, are three bar magnets; 19, 20, 21, and 22 are four coils of insulated wire. The three magnets are fixed on an arbor 23, so as to revolve freely, the upper and lower in the slots of the coils, the middle one between the coils. The magnets are fixed with their poles alternating, as shown by the letters N, S, N, so that when electric currents are sent through the coils in the same direction the action on all three magnets will be to turn or deflect them in the same direction; 1, 2, and 12 and 13 are four contact springs tipped with platinum; 3, 4, 14, and 15 are four pieces of platinum attached to but insulated from the pendulum by pieces of ivory; the two, 3 and 4, are connected with the insulated binding screw 7 by the fine spiral spring 6; 14 and 15

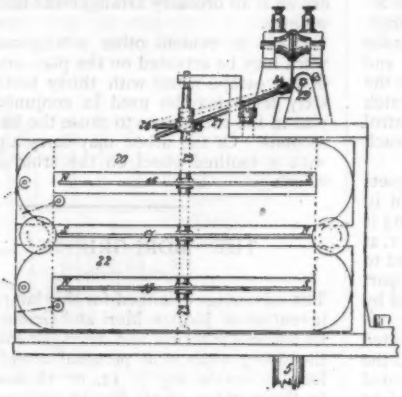

FIG. 1

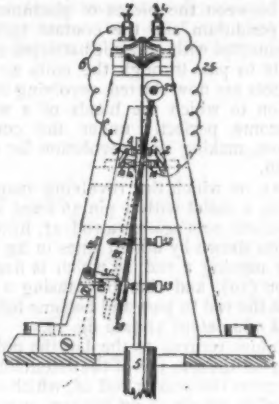

FIG. 2

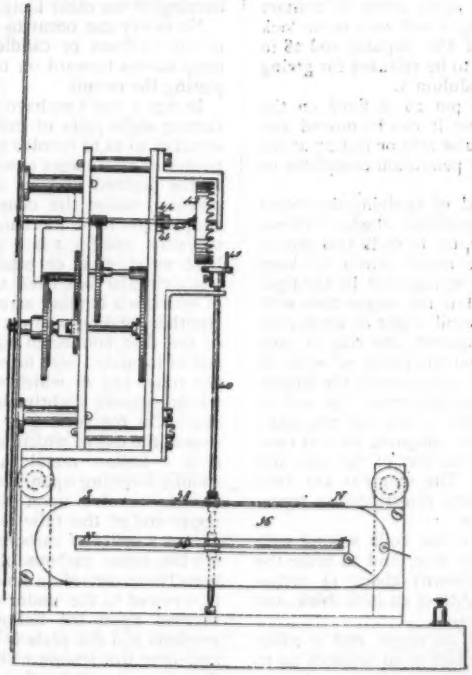

FIG. 3.

are connected with the binding screw 24 by the fine spiral spring 25.

As the pendulum swings it alternately makes and breaks contact between the pieces of platinum attached to the pendulum and the contact springs, which being connected with galvanic batteries, cause electric currents to pass through the coils 20 and 22; if the magnets are now started, revolving in the reverse direction to which the hands of a watch turn, they become perfectly under the control of the pendulum, making one revolution for each double vibration.

The arbor 23, on which the revolving magnets are fixed, carries a collet with a pin 26 fixed in it, which as it revolves acts against a rod 27, lifting it into the position shown by dotted lines in fig. 1, at the same time moving a rod 28 which is fixed to the same arbor (29), and thereby causing a part projecting from the rod to pass and become held by the hooked end of a detent 31 (see fig. 2).

As the pendulum returns to the left the pointed screw 32 acting on the arm 31^{x} of the detent lifts the detent and liberates the arm or rod 28, which aided by the gravity of a weight 34 on the arm or rod 27 (attached to the same arbor as 28) presses against the screw 33, and in the return vibration of the pendulum to the right follows it and gives the necessary impulse to keep the pendulum in motion.

The pendulum having completed its swing to the right, the magnets will have made an entire revolution and the pin 26 will again come in contact with the lever 27, and lifting it will once more lock or engage the projection of the impulse rod 28 in the detent 31, in readiness to be released for giving another impulse to the pendulum 5.

The collet carrying the pin 26 is fixed on the arbor 23 by a screw, so that it can be moved and adjusted to move the impulse arm or rod 27 at the desired moment when the pendulum completes its swing to the right.

Fig. 3 shows the method of applying the rotary magnets to driving sympathetic clocks. These, when of ordinary size, say, up to dials two feet in diameter, will not require much power to keep them going; two coils, as represented in the figs., will be found sufficient; but for larger dials with the hands exposed to the wind, eight or more coils of larger size might be required, the size of coil, weight of the magnets, and thickness of wire, all being increased in proportion to double the dimensions, so as to give the required power. 36 and 37 are two coils of wire; 38 and 39 are bar magnets; 40 is the arbor carrying the magnets, so that they may revolve freely, one in the slot of the coils and the other above the coils. The magnets are fixed with their poles in opposite directions, as represented by the letters N.S.N.S.

It is found best to have the coils wound with about 1,500 yards of No. 35 wire, and to make the magnets (for the clocks shown) about $4\frac{1}{2}$ inches long, $1\frac{1}{2}$ inches wide, and $\frac{1}{10}$th of an inch thick, and of a weight of about 500 grains.

The arbor 40 carries at its upper end a collet with a pin 41 fixed in it, which is so adjusted as to take into the teeth of the escape-wheel 42, having thirty teeth moving it forward, one tooth or two seconds for each revolution of the magnets; the arbor 43 of the escape-wheel is held by two springs 44, 45, which are made to press with such force as to prevent the wheel from moving except when acted upon by the pin 41.

The train of clockwork represented as being thus driven is an ordinary arrangement minus springs or weights.

It will be evident other arrangements of clockwork may be actuated on the plan, and that instead of the escape-wheel with thirty teeth, a wheel of sixty teeth may be used in conjunction with two pins in the collet so as to cause the hand to indicate seconds. Or the arbor may carry a pinion in gear with a toothed wheel on the arbor 43 or its equivalent.

THE MORI-GRIFFIN LAMP.

THE advantages claimed for this lamp, which is the invention of Messrs. Mori and Griffin of Leeds, are its automatic action and arrangement of parts, and the doing away with personal attention except at long intervals, say 9, 12, or 18 hours, according to the number of candles or carbons the lamp is constructed to hold.

A great saving in wire is effected by the automatic commutator or switch being made a part of the lamp. It is possible by its means to switch off and re-light at will any one or more of the lamps in circuit, without any perceptible change in the burning of the other lamps in the same circuit.

No injury can occur to the lamp after the whole of the carbons or candles are consumed, as the lamp moves forward on to a contact, thereby completing the circuit.

In figs. 1 and 2 we have illustrated a lamp for consuming eight pairs of carbons. This lamp is constructed so as to revolve upon a central spindle, and possesses advantages over the foregoing, inasmuch as the lighted carbons always occupy the same position, whilst the construction of the lamp is simpler and more mechanical. Fig. 1 is a sectional elevation, and fig. 2 is a plan view. A is a disc of hard wood, glass, or other suitable substance, and B is a circular box fixed underneath, in the middle of which is a binding screw *a* and a fixed spindle *b*. Another binding screw C is fixed to the under side of the disc, connected with which is one end of a coil of insulated wire forming the electro-magnet D, the other end of which wire is fixed to the stud *c*, which projects slightly above the upper face of the disc. On the surface of the disc is also a metal stop *d*, the use of which will be hereafter explained. E is a hollow metal tube, which fits upon the spindle *b* resting upon the bottom of the box, and free to revolve upon the said spindle. At the upper end of the tube is a circular table F, which carries a series of carbons, numbered 1 to 8, which are the inner carbons of each pair, the outer carbons being carried in holders G hinged to brackets H, screwed to the under side of a circular plate J, secured upon the hollow tube E. Between the brackets and the plate is a thickness of vulcanite *e*, and over the screws which secure the brackets to the plate are bone insulating eyelets. To each bracket H is secured a contact-maker *h*, that belonging to number 2 pair of carbons being shown resting upon the stud *c*. On the upper side of the plate J are a series of flat curved springs *f*, secured

by screws to the outer edge of the plate, and having pins *g* at their inner ends, which pass down through holes in the plate. When the springs are pressed down close to the surface of the plate, the pins on the end are lower than the stop-piece *d*, but when released the bend of the spring lifts the pin clear of

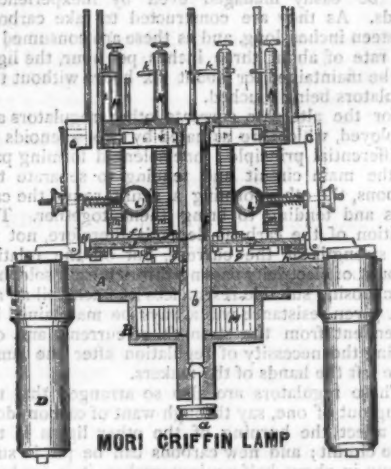

FIG. 1.

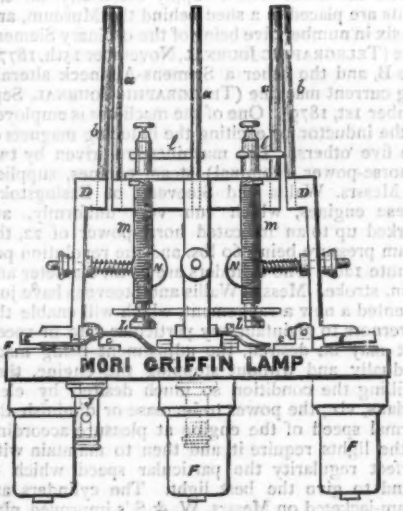

FIG. 3.

the stop-piece. For pressing down the springs *f* we have a series of fingers *f*¹, inserted at right angles into upright rods K. L are adjustable weights for tilting the outer series of carbon holders, so as to bring the tips of the carbons together; in the circular box is a coiled spring M, which is hooked into the tube E. To set the lamp the requisite supply of carbons are inserted, and the lamp wound up by turning it round upon the spindle *b* until the spring M is in such a state of tension that it will when released carry the lamp round in the direction of the arrow; the rods K are then turned round, tightening the springs on the lower portion thereof,

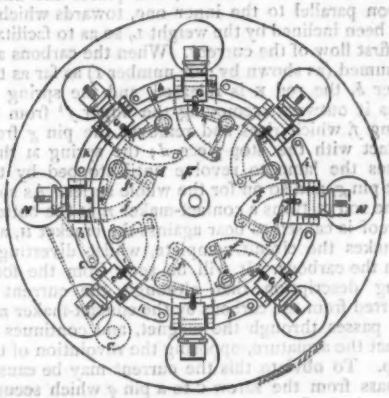

FIG. 2.

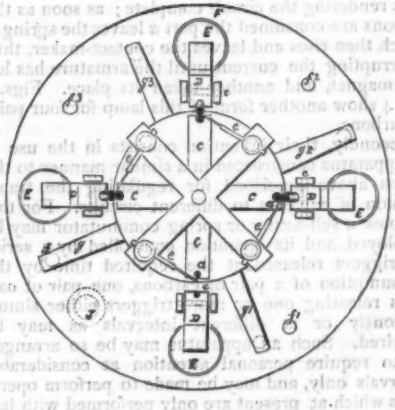

FIG. 4.

and causing the fingers *f*¹ to press down the springs *f*; and in this position they are retained by the fingers *e* which are placed so as to bear against the inner carbons; the lamp being then released it will turn round until one of the pins *g* comes in contact with the stop-piece *d*, at the same time one of the holders G will be opposite the magnet, and the con-

tact-maker *h* will rest upon the stud *c*. The circuit is then complete between the two poles of the current represented by the two binding screws C and *a*. Supposing it to enter at the screw *c* it will pass through the magnet to the stud *c*, to the contact-maker *h*, and through the holder G to the outer carbon, thence through the inner carbon forming the luminous arc, and down the pillar E to the terminal *a*. The moment the current is established the magnet attracts the armature N, and places the outer carbon parallel to the inner one, towards which it had been inclined by the weight L, so as to facilitate the first flow of the current. When the carbons are consumed (as shown by pair number 1) as far as the finger *k*, the rod K is released, and the spring *m* turns it outward, removing the finger f^1 from its spring *f*, which rises and removes the pin *g* from contact with the stop-piece *d*; the spring M then causes the lamp to revolve until stopped by the next pin *g*, and so on for the whole series. As soon as the rod K turns a contact-maker *n* at the bottom thereof is caused to bear against the bracket H, and so makes the circuit complete, whilst diverting it from the carbons. It will be seen from the foregoing description that although the current is diverted from the carbons by the contact-maker *n* it still passes through the magnet, and continues to attract the armature, opposing the revolution of the lamp. To obviate this the current may be caused to pass from the screw C to a pin *q* which secures one end of a flat spring *r*, the other end of which is raised a short distance from the face of the plate A. A pin *s* attached to the free end of this spring passes through the plate A, and directly underneath it is a contact-maker which leads to the magnet. As the lamp revolves the part *n* presses upon the spring *r*, and presses the pin down upon the contact-maker, thus rendering the circuit complete; as soon as the carbons are consumed the part *n* leaves the spring *r*, which then rises and leaves the contact-maker, thus interrupting the current until the armature has left the magnet, and another taken its place. Figs. 3 and 4 show another form of this lamp for four pairs of carbons.

Secondly, their invention consists in the use of an apparatus constructed in a similar manner to the lamps above described for regulating the transmission of currents to different circuits. For this purpose a self-acting or spring commutator may be employed, and its operation controlled by a series of triggers released at the required time by the consumption of a pair of carbons, one pair of carbons releasing one or more triggers either simultaneously or at different intervals as may be required. Such an apparatus may be so arranged as to require personal attention at considerable intervals only, and may be made to perform operations which at present are only performed with less regularity by hand.

LIGHTING OF THE BRITISH MUSEUM BY ELECTRICITY.

THE lighting of the British Museum by the electric light has been commenced for the winter season, and with great success. Two different systems are employed, the Reading-room itself being lighted by four lights of 5,000 candle-power each, produced by continuous currents, and the seven 400 candle lights, which are distributed over the entrance halls and the outside of the Museum, being connected in one circuit of about 1,200 yards length to an alternate current machine.

The regulators in the Reading-room are the invention of Messrs. Siemens and Halske, of Berlin, and are of a very simple construction, so that they can be easily managed even by inexperienced hands. As they are constructed to take carbons nineteen inches long, and as these are consumed at the rate of about three inches per hour, the light can be maintained for about six hours without the regulators being touched.

For the alternate currents other regulators are employed, which are actuated by two solenoids on a differential principle; one solenoid forming part of the main circuit and tending to separate the carbons, the other forming a shunt round the carbons and tending to bring them together. The position of the carbons depends, therefore, not on the strength of the current, but on the relative amount of electricity passing through each solenoid. By choosing suitable resistances for each coil an arc of a given resistance will always be maintained independent from the strength of current, and obviating the necessity of regulation after the lamps have left the hands of the makers.

These regulators are also so arranged that the going out of one, say through want of carbon, does not affect the burning of the other lights in the same circuit; and new carbons can be put in such a lamp in about half-a-minute, when it is ready to burn for another five hours.

The machines which supply electricity for the lights are placed in a shed behind the Museum, and are six in number, five being of the ordinary Siemens type (TELEGRAPHIC JOURNAL, November 15th, 1877), size B, and the other a Siemens-Alteneck alternating current machine (TELEGRAPHIC JOURNAL, September 1st, 1879). One of the machines is employed as the inductor for exciting the inducing magnets of the five others. The machines are driven by two 8 horse-power (nominal) steam engines, supplied by Messrs. Wallis and Steevens, of Basingstoke. These engines, which run very uniformly, are worked up to an indicated horse-power of 22, the steam pressure being 60 lbs. and the revolution per minute 120. The cylinders are 9½ in. diameter and 13 in. stroke. Messrs. Wallis and Steevens have just patented a new arrangement, which will enable the governors to maintain any particular rate of speed that may be desired, the adjustment being made gradually and without stopping the engine, thus fulfilling the condition so much desired by electricians, viz., the power to increase or diminish the normal speed of the engine at pleasure according as the lights require it, and then to maintain with perfect regularity the particular speed which is found to give the best light. The cylinders are steam-jacketed on Messrs. W. & S.'s improved plan of making the jacket and liner separate and fitting the liner into the jacket. The boilers are tested by hydraulic pressure to 150 lbs. per square inch, viz., double the highest working pressure of 75 lbs. to the inch. The fire-grate area and the amount of heating surface are unusually large. The engines are fitted with the makers now well-known Patent Annular-space Feed Water Heater, which delivers the feed water into the boiler at a temperature of

about 205 degrees, the special feature of this heater being that the exhaust steam is not mixed with the feed water; that the water is heated after passing through the pump, thereby getting rid of the difficulty of pumping very hot water; and that the whole of the heating surface over which the feed water passes can be exposed for cleaning in less than five minutes by the removal of two small covers.

The leading wires from the machines to the lights in the Reading-room are brought over the roof of the buildings to the lantern on the top of the dome, being a distance of about 200 yards, whereas the leads for the other lights are laid partly in the basement and partly in pipes underground.

EDISON'S ELECTRIC GENERATOR.

WHEN Mr. Edison said he was about to produce a practical economical electric light for general use, the entire business world took it for granted that it was forthcoming. Gas stocks tumbled both in this country and in Europe, and the people waited for the coming light. Scientists having had experience in this direction shook their heads, but for the most part suspended judgment.

Delay on the part of Mr. Edison comforted the holders of gas stocks, and confirmed the scientists in their belief that he had undertaken not only a task of great magnitude and difficulty, but one that would require more time and means than could be controlled by most experimenters. But Mr. Edison, flushed by his scientific victories, was undaunted and determined to yield to no obstacles.

Unfortunately, however, the daily papers from time to time printed reports of progress in electric lighting, which, from their extravagance and inaccuracy, placed Mr. Edison, to say the least, in an extremely embarrassing position as regards his alleged promises and the expected fulfilment of them, besides misleading the public as to the true nature of the problem to be dealt with, resulting in a reaction of feeling prejudicial to Mr. Edison's just fame.

At present little is said by Mr. Edison concerning his electric light, excepting that he considers it an assured success, and that he is perfecting the details of his electric lighting system as rapidly as possible.

It is not our purpose just now to enter into a description of Mr. Edison's electric lighting system as a whole, but to describe his new electric generator—one of the most important factors of the system—and also to describe his new electrical motor used in driving light machinery for domestic and industrial purposes.

The new generator resembles in some respects other well known forms, but it differs from them all in several very important particulars; for instance, the field-magnets are immense, being about 54 inches high, and weighing about 1,100 lbs. The magnet cores—of wrought iron—are 6 inches in diameter, and 36 inches long; they are mounted upon heavy cast iron blocks, 10¾ inches high and 9 inches wide, and are connected at the top by a wrought iron yoke, 6 inches high and 7 inches wide. The cores are wound with 3 layers of No. 10 cotton covered wire, the ends of which are connected with binding posts on the base of the machine. The two blocks upon which the cores rest, as well as the bearings of the armature, are supported by a cross-shaped brass casting.

The armature which revolves in the cylindrical space between the poles of the field-magnet is shown in section in Fig. 1. It consists of a wooden cylinder, A, mounted on a 1½-inch shaft, and having attached to its ends soft iron plates, B, between which there are several layers, D, of No. 20 soft iron wire wound circumferentially. Outside of the iron discs, B, there are vulcanised-fibre discs, C, having their peripheries notched to receive the several coils, E, of insulated wire wound lengthwise on the cylinder and connected with copper bars, F, of the commutator cylinder, G. There are $41\frac{13}{1000}$ inch wires in each strand, and each strand passes lengthwise around the cylinder on diametrically opposite sides, the opposite ends of all of the wires in each strand being soldered to commutator bars on opposite sides of the commutator cylinder. There are 40 strands surrounding the armature, and the commutator cylinder is pressed on opposite sides by copper wire brushes which take off the current. The armature shaft has a 10-inch pulley with a 5-inch face, and the speed of the machine is about 500 turns per minute. Although the current from the armature may be used to excite the field-magnet, Mr. Edison finds it more economical to charge the field-magnet by means of a separate machine. In fact, he intends to charge a battery of such generators with a single Faradic machine of this form.

An important fact has been developed in the course of Mr. Edison's experiments with this generator. He finds that by connecting the ends of the field-magnet by a copper wire for a moment when the machine is started, the field-magnet soon attains its maximum charge, which it retains so long as the generator is in continuous operation. It requires a minute or more to fully charge the immense magnets, and when charged their influence is far reaching and powerful. The internal resistance of the armature is only ¼ ohm, and Mr. Edison claims that he realises 90 per cent. of the power applied to this machine in effective external current. It requires but 5 horse-power to drive it, and the current generated is sufficient to make 40 lights of 16 candles each. The economy of this machine is shown by the fact that one man may turn it with sufficient rapidity to maintain the electric arc of a Jablochkoff candle.

While this generator in general principle is the same as in the best of the well-known forms, still there is an all-important difference, which is, that it will convert and deliver for useful work nearly double the foot-pounds of energy that any other machine will under like conditions. It has been shown by Hopkinson that the Siemens machine, which is generally recognised as the best form yet devised, converts from the belt to the circuit 92 per cent. of the energy, but later corrections reduce this to 83 per cent.; from these results many scientists have inferred and stated that there was little margin for improvement in the generating machine. Now the energy converted is distributed over the whole resistance; hence if the resistance of the machine be represented by 1, and the exterior

circuit by 9, then of the total energy converted, $\frac{9}{10}$ will be useful, as it is outside of the machine, and $\frac{1}{10}$ lost in the resistance of the machine.

The Siemens machine, and nearly all other machines in use, make the external resistance equal to that of the machine; hence one-half of the energy only is useful, and any attempt by these inventors to increase the exterior resistance, so as to change the distribution of energy to obtain more exterior work, results in reducing the power of the machine to convert energy. Therefore, efforts toward economy in one direction are met in the other direction by loss in the interest account due to the necessity of using a greater number of machines to convert a given amount of power.

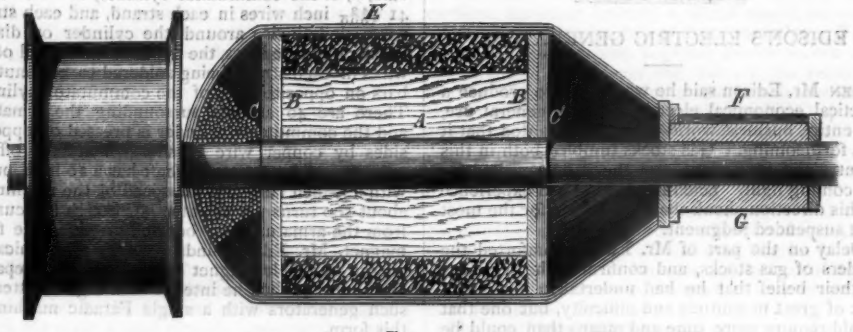

FIG. 1.

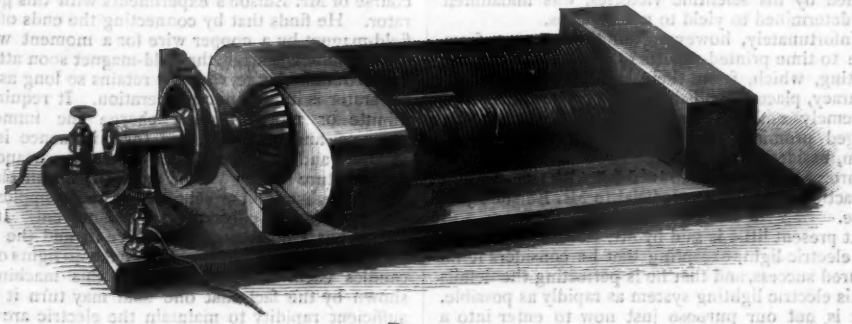

FIG. 2.

In Mr. Edison's generator 5 horse-power is transferred upon a resistance of 5 ohms, of which a $\frac{1}{4}$ ohm is in the machine, thus delivering $\frac{9}{10}$ of the total current upon a circuit exterior to the machine; thus nearly the maximum economy is attained when other machines, under like conditions, will scarcely give any current at all.

In dealing with the electric light problem, Mr. Edison has very properly devoted a large share of time and attention to the production of an economical generator, as it is the very foundation of the system. It bears the same relation to electric lighting that the cheap production of gas does to gas-lighting. It is as important to generate electricity cheaply as to use it economically. Mr. Edison meets squarely both ends of the question, and is carrying on his experiments on a gigantic scale; being encouraged by new developments he continues his researches in expectation of still better things. His electric generator he considers complete; his electric lamp, although in good usable form, is slowly improving, and will not be introduced to the public so long as Mr. Edison thinks it can be improved.

Fig. 2 shows Mr. Edison's new electric motor intended for running sewing-machines, small elevators, lathes, and other light machinery, by connecting it with the same wires that furnish the current for the electric lamps. Its construction differs but slightly from the electric generator. The armature is arranged parallel with the magnet instead of transversely, and the magnet is formed of a single casting. In other respects it is like the generator, having the same form of armature, also commutator, cylinder, and brushes. The engraving represents the motor about one-fourth of its real size.

Whatever may be said or thought in regard to Mr. Edison's progress in electric lighting, it cannot be denied that he has made important discoveries which must tend to cheapen the electric light generally, and when he shall have completed his electric lighting system we hope he will reap the reward merited by his untiring perseverance.—*The Scientific American.*

Correspondence.

To the Editor of THE TELEGRAPHIC JOURNAL.

ELECTRO-SOLAR ALARM.

SIR,—I read in your interesting Journal that an electro-solar alarm *has been invented*, by which a bell is rung when the sun passes the meridian. Already certain French journals had reported that so-called invention with a great fuss, and I did not think it worth while to claim it, because of its small importance; but since the TELEGRAPHIC JOURNAL, which is a serious organ, seems to attach some interest to it, I feel myself called upon to inform you *that this invention is only the germ of an apparatus which I designed and constructed in 1856 under the name of the Electro-solar Regulator.* You will find a long description of it in volume ii., page 255, of the second edition of my work on the Applications of Electricity, published in 1856. That apparatus aimed not only at indicating the moment of passage of the sun across the meridian, but also to adjust to the true meridian the hands of a clock, and thereby to indicate the true time. I described two plans for this purpose: but the second gave the best results. My descriptions are accompanied by very exact figures, which are engraved in plate vii. of the said volume.

This description is also reproduced in the fourth volume of my last edition, page 78. The idea has been taken up two years later by M. Régnard, and in 1868 by the Abbé Candido de Leece.

I beg you to accept the assurance of my best sentiments,

DU MONCEL.

Libisy, near Caen, Oct. 18th.

LIGHTNING CONDUCTORS.

SIR,—In the summer of 1878 delegates were nominated by the following societies, viz., the Royal Institute of British Architects, the Society of Telegraph Engineers, the Physical Society, and the Meteorological Society, for the following purpose:—

"To consider the possibility of formulating the existing knowledge on the subject of the protection of property from damage by electricity, and the advisability of preparing and issuing a general code of rules for the erection of lightning conductors."

The delegates have held several meetings, and have already collected, firstly, from the manufacturers of lightning conductors, and secondly, from the members of the Royal Institute of British Architects, a large amount of thoroughly practical information. Several of their number are also engaged in forming abstracts of the salient features of the literature of the subject.

The members of the Conference are, however, most anxious that their report should be as trustworthy and as exhaustive as possible, and they have therefore instructed me to ask you to assist them by publishing this epitome of their proceedings, and allowing them to invite correspondence upon the points mentioned below.

I am, Sir, your obedient servant,

G. J. SYMONS, F.R.S.,
Secretary to the Conference.

LIGHTNING ROD CONFERENCE,
30, *Great George Street, S.W.*

CLASS OF FACTS MOST REQUIRED.

Full details of accidents by lightning, stating especially whether the building struck had a conductor or not. If there was a conductor, state its dimensions—construction—mode of attachment to building—whether its top was pointed—distance of its upper terminal from the place struck—nature and extent of the connection between the conductor and the earth, and whether the earth was dry or moist—whether the conductor was itself injured—and whether the conductor or the point struck was the most salient object in the vicinity. Information is also desired, either verbally or by sketches, as to the position of metal spouting and lead roofing relatively to the point struck, and to the conductor.

Details of the thickest piece of metal melted by a flash of lightning are much needed.

Unimpeachable evidence of the failure of conductors is much desired, as such failures would be extremely instructive.

SUBSCRIBER, T. W.—We hope soon to obtain further information respecting the subject of your query.

Notes.

PROTECTING CARBON ELECTRODES.—The practice of coating carbons with copper to preserve them from consumption by ordinary combustion, is to a certain extent defective, by reason of the white-hot carbon oxydising the copper itself. This fault has been remedied by Mr. Willey, an American, who first covers the carbon with a thin coating of plaster of Paris, and then coats it with copper by galvano-plasty. This has the effect, according to Mr. Willey, of making the duration of the carbons ten times longer, and giving a much more tranquil light.

THE RADIOMETER UNDER MAGNETISM.—A German experimenter, Herr Basso, recently brought an ordinary radiometer with four mica vanes blackened on one side, rapidly rotated by the light of a gas flame, under the influence of a strong electro-magnet. The result was a slight reduction of the velocity of rotation, caused, perhaps, by magnetic action on the vanes, and on the oxygen of the air, and perhaps, also, by electric currents produced by the motion of the vanes.

THE TELEPHONE AND BALLOONS.—Two French balloons, the *Européen* and the *Observatoire Aérien*, made a recent ascent from the Villette factory, Paris, connected by a telephonic cable, which, however, had to be cut on the balloons taking different courses.

ELECTRICITY IN THE HOUSE.—A small pamphlet on this subject by Messrs. Johnston & Co., gas engineers and electricians, will help to enlighten the public as to the conveniences of electric bells, fire and burglar alarms, &c., in the house.

MR. F. H. BROOK, Walworth, has issued a useful price list of electrical apparatus.

THE *Great Eastern*, which has been lying in the Medway, Sheerness, for some time, is, we hear, to be fitted with new boilers and engines at a cost of £100,000, and is then to carry cattle from Texas to London.

TELEGRAMS IN FRANCE.—Eleven million telegrams were sent in France during the year 1877, or about one for every three inhabitants. In Belgium during 1878 two millions were despatched, making about one for every two and a half inhabitants. In that country the

tax for "urgent" telegrams is double the ordinary tax, and the number amounts to about two per cent. of the whole.

INTERNATIONAL telegrams between Belgium and Holland will be charged henceforth at five centimes per word, with an obligatory maximum of ten words.

THE Eastern-Extension Telegraph Company are taking steps to lay the long-talked-of cable from Hong-Kong to Manilla.

THE recent hurricane and floods in Andalusia, Spain, have, more or less, destroyed all the railway and telegraph lines in the province.

THE French ministry of war have organised a system of optical telegraphy, and placed it under the supervision of the director of aerial communications, who manages the balloon and carrier-pigeon service.

THE Japanese telegraph system is to be completed in two years.

AMERICAN meteorologists are proposing light-ships and observatories to be moored on the Atlantic, and placed in communication with the submarine cables there so as to transmit weather reports. (!)

THE TELEGRAPH WAR in America is at last settled, and an agreement has been signed between the two rival companies to the effect that: The poles of the American Union Company are to be placed forty feet high, allowing seven arms or less to each pole, the wires to be strung twelve feet clear, and below those of the Western Union Company's wires, where the poles of the two companies are placed in proximity to each other. All suits are to be discontinued without loss to either party; there is to be no prosecution of the employés of either company, and both companies agree to in no way hinder the other in the prosecution of their work. The agreement is to remain in force for one year. Immediately after the signing of the agreement the work of putting the entangled wires in order was resumed. The lines of the American Union Company are being errected at the rate of 100 miles a day; but it is expected that they will not now be ready for business till November 1. They will then open with 10,000 miles of wire, in addition to the Dominion lines leased some time ago, and from 400 to 500 offices in circuit.

THE ZANZIBAR AND ADEN CABLE.—The Telegraph Construction and Maintenance Company's steamers Scotia and Zanzibar have been despatched from London with the Zanzibar to Aden section of the Cape cable, and the company expect that communication beween Aden and South Africa will be open before the end of December. The Mozambique-Zanzibar section was completed on October 3rd.

THE LIBEL on Colonel Croll, director of the old United Kingdom Telegraph Company, by the *Investigator* newspaper, came before the Recorder on October 24th. Mr. Metcalfe, who appeared for the prosecution, stated that in 1861 the plaintiff and a number of other gentlemen of position and eminence were directors of the United Kingdom Telegraph Company, and it appeared that there had been disputes between a person named Allen and the directors, from whom Allen claimed a large sum of money. The learned counsel detailed the various proceedings in the law court connected with this claim, and said that in every instance he was defeated, and the directors were completely exonerated from any liability, either legal or moral, but they were put to heavy costs, none of which, or a very small portion, were ever paid. In 1868 the different telegraph companies were taken over by the Government; and although a large sum no doubt was paid to the company, it was a most profitable bargain, and he believed that but for certain circumstances that existed at the time the directors would have required a much larger amount. After the transaction had been completed a charge was made against the directors of having defrauded the Government of £400,000 by means of false and fictitious entries in the books of the company. An investigation was ordered by the House of Commons; a full inquiry took place; every facility was afforded to the parties to prove the truth of the charges they had made; but they utterly failed, and the report of the committee of inquiry upon the subject was that there was not the slightest shadow of foundation for these charges, and the directors were completely exonerated. Notwithstanding this, the defendant, in July of the present year, started a publication called the *Investigator*, and in that journal he raked up the whole of the previous proceedings, and distinctly charged Colonel Croll with having defrauded the Government in the way stated. Mr. Houghton, who appeared for the defendant, Mr. Isaac Montgomery Gadd, proprietor, pleaded guilty to the charge, and withdrew the former plea of justification. The Recorder sentenced Mr. Gadd to four months' imprisonment.

VARZIN, the Pomeranian residence of Prince Bismarck, is, of course, in telegraphic communication with Berlin, and it is stated that as many as 650,000 letters and 10,000 telegrams passed through during a recent year for the great Chancellor, who, by the way, only resides there during summer and autumn.

WE regret to hear that Mr. T. Edison, nephew of the famous electrician, whose figure became familiar to us during last winter, has just died from consumption in Paris, where he went to look after his uncle's patents.

CITY AND GUILDS INSTITUTE.—The City and Guilds of London Institute for the Advancement of Technical Education announce the opening of their Technical Classes, at Cowper Street School, Finsbury. In the Section of Applied Physics, Mr. W. E. Ayrton will deliver a course of 12 lectures on "Some of the Practical Applications of Electricity and Magnetism," commencing Monday, November 3rd, at 7 p.m. In that of Applied Chemistry, Dr. H. Armstrong, F.R.S., will deliver a similar course on "The First Principles of Chemistry," commencing Wednesday, November 5th, at 8 p.m. An Inaugural Lecture will be delivered by Mr. Ayrton, on Saturday, November 1st, at 8 p.m., on "The Improvement Science can Effect in our Trades, and in the Condition of our Workmen." A syllabus of each Course of Lectures can be obtained at the Halls of the Companies of Mercers, Clothworkers, and Drapers, or at the Schools, Cowper Street, Finsbury. Intending students should send in their names to the Demonstrator, Cowper Street Schools, Finsbury, E.C. The Inaugural Lecture will be free. The aim of these lectures will be to train the students, by an examination of the machines, instruments, &c., employed in the arts (or of models of them), to turn their attention to the scientific principles governing the action of these machines, without a knowledge of which neither their proper working can be ensured nor improvements in them effected. It is believed that this analytical method of experimental instruction will, for the class of students expected to attend, be preferable to the ordinary method

adopted in the teaching of natural philosophy, which consists in much time being first spent in the study of the elementary principles, and then only subsequently the practical applications explained. The lectures will be given on Mondays at 7 p.m., and Fridays at 8 p.m., commencing Monday, the 3rd November.

November 3, 7, 10, 14, 17, 21, 24, 28.
December 1, 5, 8, 12.

New Patents—1879.

4082. "Greatly increasing the speed of working submarine cables and underground wires or telegraphic lines." T. J. JONES. E. BULL. Dated Oct. 9.

4170. "Means and apparatus for interlocking the telegraphic block instruments with the points and signals of railways." C. HODGSON. Dated Oct. 15.

4189. "Electric telegraph terminal and shackle insulators." C. E. CREIGHTON. Dated Oct 16.

4306. "Improvements in automatic contact-breakers for electric bells and other electric or galvanic circuits." T. WILKINS. Dated Oct. 22.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1879.

805. "Magneto-electric apparatus." W. P. THOMSON (communicated by W. W. Gary, Washington, U. S.). Dated Feb. 28. 6d. This describes a magneto-electric machine in which the armature moves in the magnetic field to and across a neutral line. It is an improvement on patent 2364, 1877, and contains the principle of the exploded "Gary motor."

830. "Electric lamps." G. G. ANDRÉ. Dated March 1. 8d. This consists in an electric lamp for mines. A series of thin carbon rods resting on a larger piece of metal or carbon form the electrodes. The smaller rods slide easily in tubes and are lightly pressed by weights on the larger electrode. The current is passed from the small to the large carbon and the point of the former is rendered incandescent thereby. By means of a commutator one of the carbons only is kept in a state of incandescence at a time, and when it is inoperative the next is put in circuit. The carbons are enclosed in a glass cylinder containing nitrogen and carbonic acid, to prevent explosions, and also to prevent wasting of the carbons. The glass cylinder may be silvered at the top or fitted with reflectors to diffuse the light. The lamp may be made to stand or hang.

854. "Producing and converting electric force into motive power." H. POST and T. VARLEY. Dated March 4. 2d. Electricity is got from a trough battery, turned into magnetism by electro-magnets, and into motive power by a movable armature. Induction plates are used in connection with the battery to wipe out the residual magnetism of the cores of the electro-motor at each break of the actuating current. *(Not proceeded with.)*

876. "Electric lighting." J. B. SPENCE. Dated March 15. 2d. Between electrodes of platinum (cooled by circulation of water) a current is passed so as to form an arc, and into it a flame of gas, oil, or spirit, or else a carbon point, is inserted. The result is a highly intense electric light. *(Not proceeded with.)*

925. "Electric lamps." K. W. HEDGES. Dated March 8. 6d. This consists in preparing magnetic carbon electrodes for lamps by attaching to them wires or strips of iron, or mixing iron filings or magnetic iron ore with them, or depositing a layer of iron on them. They are then placed in tubes or guides in which they can freely slide towards each other, or one may be stationary or moved by a weight or spring or by flotation, whilst the other is arranged so as to descend by its own weight towards the other. Near the carbons so mounted poles of an electro-magnet are placed, so that when excited by a strong current they will attract the magnetic carbons and thereby retard or allow their motion. In this way the regulation of the arc is effected.

City Notes.

Old Broad Street, Oct. 29th, 1879.

THE war between the old Atlantic cable companies and their new rival, "La Compagnie Française du Télégraphe de Paris à New York," which every one has foreseen for some time past, is at last declared. Mr. Weaver, the esteemed general manager of the Anglo Company, has publicly notified that from the day of the opening for traffic of the new company, the tariff of the Anglo Company, *via* Valentia or *via* Brest, for messages between the United Kingdom or France and New York and Canada, will be reduced to 6d. and 60 centimes per word respectively. He also notifies that a new cable will be laid for the Anglo Company in 1880, in order to provide for the large increase of business anticipated, as the probable result of the above reduction of tariff. It is to be feared that at the 6d. rate no dividends can be paid by either of the companies, and it is not unlikely that the receipts will not suffice to cover their working expenses. The number of messages sent will naturally increase, perhaps considerably, and provided all the cables were equal in sending capacity, the Anglo Company should be able to get through most work in a given space of time, because of its greater working capacity. It would, however, be interesting to know what is the working rate of the existing cables; various rumours are afloat, but we should like to have some authentic information on the subject. What are the duplex systems going to achieve in this warfare? They should be of great assistance to the cables already complete. The Compagnie Française will, without doubt, have possession of a cable of high electrical quality, and, were it not for the Direct United States cable belonging, practically, to the Anglo Company, the sending powers of both companies would not be so very unequal. As another cable is to be laid in 1880 by the Anglos, there would seem to be need of more ways of communication, notwithstanding the introduction of duplex working. The new company, it will be remembered, also propose to lay a cable in the spring of next year. The Faraday has arrived on the other side of the Atlantic with the last portion of the new cable, and we may therefore soon expect to hear of the successful completion of her task.

Much opposition, we learn from America, is to be offered to the landing of the shore end on the other side of the Atlantic, and also injunctions are being prepared against the use of the wires of the American, and the Baltimore, and Ohio Telegraph Companies by the French Company, but we doubt if these efforts will arrest the progress of the opposition.

THE WEST INDIA AND PANAMA TELEGRAPH COMPANY.—The fifth ordinary general meeting of this company was held on Wednesday, October 22nd, at the City Terminus Hotel, Mr. C. W. Earle presiding. The chairman, in moving the adoption of the report and accounts (an abstract of which appeared in our last issue), remarked that, "The history of the company was one which went far to disprove the suggestion

contained in the old saying of it being a long lane that had no turning. They had travelled that lane for some time, and although they had thought they saw rays of light occasionally coming across their path, it must be admitted that all those bright hopes had gradually faded away, and they could only come to the conclusion that, looked upon as a field for telegraph enterprise on a commercial basis, the West India colonies were unprofitable. It was said that the man who waited long enough always got what he wanted, but, unfortunately, in their case, while they were waiting the cables on which they depended were running through their span of natural existence, and were approaching that decay which must end in the cessation of their operations, and, unfortunately, during their lifetime they had not been able to put by such reserves as were sufficient to relay or restore them when they ceased to work. With these facts staring them in the face, it was natural to ask, what was their policy? Were they to see their cables gradually dying out before their eyes, and to see the eventual loss—he did not say when it was to occur—of a great part of the capital sunk in the endeavour to connect the West Indian colonies with the rest of the world by telegraph, and were the colonies to be deprived—to lose, in fact, their communication with the home country, which in these days almost every colony of any size or importance thought it necessary to have? The only policy that they had—they had tried everything they knew of—was to continue their importunity with those who were so largely concerned in having a continuance of the system." He also remarked, "He had been struck with an article in the *Colonist* of Demerara, an article which contained, in the midst of a great deal of common sense and liberality of feeling, some reflections on the company which were not deserved. The article, he might say, did not entirely approve of the policy of the Government in this matter, but it traced the cause of their unfortunate position and their impecuniosity to their own folly and bad policy, and particularly in the matter of high rates. Now, those rates were fixed originally by the colonies themselves. The rate originally was for 20 words. Soon after the company was formed a very great concession was made by the company to the public of those colonies, for they diminished the minimum of 20 words to 10 words, charging only half the rate fixed for 20 words. It was very much less remunerative to carry a 10 word message at half the rate hitherto charged for a 20 word message. When the present board took office the 10 word rate was in force, and they found after working for two or three years with the system in complete order that there was not revenue enough to pay their working expenses, pay the small dividend they did on two or three occasions, and put by sufficient money for the renewal of the cables. They then applied for an increase of the rates, and the higher rates they were allowed to introduce had resulted in an increased revenue of £18,500 a year. If it had not been for that policy of theirs and that increase of rates, they would hardly have been in existence now, for there were many things they would have been perfectly unable to carry out. He thought it a pity, therefore, that people should have such an erroneous idea, and prejudice the minds of their fellow colonists in this manner." He then moved the adoption of the report and accounts, and the payment of the dividends recommended on the First and Second Preference Shares. Mr. William Ford, a director, seconded the motion. Mr. William Abbott thought that the Chairman had attached too much importance to the article in the paper he had referred to. He thought that the directors should go on and administer the affairs of the company as they considered best in the interests of the company. He would like to know, as the report was only to the 30th of June, whether the colony of Demerara had really deducted the subsidy. He thought it would be a very awkward time for that colony to be on bad terms with the company, looking at the very general rise which had taken place in everything the West India islands produced. The Chairman, in reply to questions, said they had entered into a contract for picking up the Investigator for £14,500, and it was expected that the vessel and its machinery would be picked up for £16,000. They had had no offers from the underwriters with respect to the vessel, and the claim for the amount of the insurance was awaiting settlement at law. They had received information that up to the present Demerara had withheld the subsidy. The motion was then put and carried unanimously.

EASTERN EXTENSION, AUSTRALASIA, AND CHINA TELEGRAPH COMPANY, LIMITED.—The twelfth ordinary general meeting of the shareholders of this Company was held on Wednesday, October 22, at the City Terminus Hotel, under the presidency of Mr. J. Pender, M.P. The report, an abstract of which appeared in our last issue, having been taken as read, the chairman said: Then before putting the resolution to the meeting for its adoption, I will, as usual, give you a few figures on the working of our system. As stated in the report, the gross receipts for the half-year ending the 30th of June, 1879, were £150,107, against, for the corresponding period of 1878, £135,482, showing an increase of £14,624. The expenses for the past half-year amounted to £65,509, against, for the corresponding period of 1878, £61,222, or an increase of £4,287. This is more than covered by the expenses of keeping three repairing vessels during the last half-year instead of two, as in the corresponding period of 1878, and by carrying an additional £1,000 to the maintenance ships' reserve fund. But for this a saving of about £2,300 would have been shown. The screw steamer, Edinburgh, has now, however, been sold, as stated in the report, for £10,000. The net revenue for the half-year under review was £84,597, in the corresponding period it was £74,260, being an increase of £10,337. Two interim dividends of 1½ per cent. each, absorbing £49,937 10s., have been paid for the half-year, leaving a balance of £34,660 to be carried forward. As to the duplicate Australian cable, the first section of it was successfully laid and opened for traffic on the 16th of August last, and connected Malacca. This was done by arrangement with the Government of the Straits Settlements, who have to pay the company an annual subsidy of £1,000 for ten years. A considerable portion of the second section between Singapore and Java has been laid, and a vessel with the necessary cable to complete the section is now on her way to Singapore. We anticipate that the contractors will complete the whole work in the early part of next year. The articles of association state that in case of a vacancy in the auditorship it shall be filled up by an extraordinary general meeting. As, however, Mr. Ball's death took place so recently, the directors considered it unnecessary to call a meeting specially for the appointment of a successor, and therefore requested Mr. Ball's firm to complete the audit to the 30th of June. The vacancy will be filled up at the extraordinary meeting which is to be held at the conclusion of this meeting. Now, gentlemen, I have given you certain figures, or rather made certain comments, upon the report which you have in your hands. I may now say a few words, and those of congratulation, on the general improvement of our traffic. I have stated that up to the end of

the half-year ending 30th June last we have shown a net profit over the corresponding period of the previous year of £10,000. From that time up to the present I am glad to say that our traffic has generally been very successful indeed—in fact, I may say that we are having now the best traffics we have ever had, and this may be to a certain extent accounted for in two ways. There is the Exhibition going on at Sydney for the present month, and there is a general improvement in trade. I have very often said at these meetings that our telegraph system is a very good barometer of trade. With bad trade we suffer, with good trade it is quite remarkable the buoyancy that takes place, and I hope that the improvement which is now pretty well acknowledged to exist will be maintained. You know that we have always been told that any improvement was to come from America. Well, America is very rampant at the present moment, and that is also testified by the returns on the Atlantic cable system. I have often also said that the importance of duplicating your cable was very great indeed; and I may mention that while our cable has no interruption at the present time, yet, had we not laid down our duplicate system—or that portion between Singapore and Penang—we should have been at a standstill. The original cable is now interrupted, and the whole system would have been interrupted. Fortunately this duplicate was laid down in time, and we are reaping the benefits of additional security and also of the improved traffic. I am glad also to tell you that, with regard to the duplicate cable which we are under contract to have completed by the end of February next, that we were enabled, without any loss or sacrifice on our part, with the sanction of the Australian Government, to give the home Government evidence of our desire to help them in having the Cape cable established; and I am glad to say this, notwithstanding our helping them in this object, the duplicate system will, I believe, be completed very early next year, or nearly two months before the contract time (hear, hear). I am also glad to tell you that Colonel Glover has visited all our stations. He was absent from London for something like eighteen months, and he has been able to give us a report of the working of our system, and I am glad to say that this visit has been of very great good, as you can well conceive. Our young men like to see their managing director among them, and I believe that Colonel Glover's visit has been productive of very great good. We were also able to avail ourselves of his presence in Australia to carry to a successful issue the negotiations with the Australian Governments. To do this Colonel Glover had to get them into a spirit of harmony for the benefit of the whole, which is rather a rare thing to get done. Each thinks that he knows better than his neighbour, but in this particular business of the duplicate cable they seem to be pretty well in accord. Colonel Glover has travelled during the time he has been away something like 40,000 miles. I am also pleased to say that up to the present time the experimental system of sheathing our cables with a brass coating has been successful. With these remarks, gentlemen, I think that I have pretty well exhausted all that I have to say to you, except this—that, as you are all aware, an important conference was recently held in London of the telegraph representatives of every Government, certainly of Europe, which laid down certain laws. We had not a seat at that conference, but so far we have always felt that we have been fairly dealt with by the conference. There is, however, a difference of opinion among some of the merchants at the present time, who think that they have been more or less aggrieved by certain alterations that have been made. But I will only make this remark—that we have no power to alter what has been done. We have certainly the power of receiving communications from merchants who feel themselves aggrieved, but I would say to those merchants that, looking to the history of submarine telegraph progress, up to the present time they have certainly had the best of it (hear, hear). They have dealt with the code system to an extent that was never contemplated. Had the original prospectus of this company been carried out, we should have been paying you to-day probably 35 per cent. instead of 5 per cent., and, therefore, the merchants have no cause to complain. They have done all they could—they have used their utmost ingenuity. I do not blame them for this. I think it quite reasonable that they should have the greatest amount of traffic carried at the smallest expense; but, on the other hand, they must take care not to kill the goose that lays the golden eggs (hear, hear). If any merchant feels himself aggrieved I shall be very glad to meet him and discuss the question, and I am satisfied that I will show him that the greatest benefit of the system has been with him and not with the shareholders. With these remarks I beg to move the adoption of the report. The resolution is—"That the report and accounts of the directors now submitted be received and adopted." The Right Hon. W. N. Massey, M.P., the Deputy-Chairman: I beg to second that. After some further remarks as to the appointment of an auditor in the place of the late Mr. John Ball, and the report and accounts having been adopted, the proceedings terminated.

THE BRAZILIAN SUBMARINE TELEGRAPH COMPANY, LIMITED.—The twelfth ordinary general meeting of the shareholders of this company was held Oct. 28th, at the City Terminus Hotel, Cannon Street, under the presidency of Viscount Monck, chairman of the company. The chairman, in moving the adoption of the report, pointed out that the revenue for this period amounted to £75,083 13s. 11d.; the working expenses to £13,452 14s. 4d., leaving a balance of £61,630 19s. 7d. To this is added £23,301 16s. 9d., the undivided profits to 31st December last, making a total of £84,932 16s. 4d. After deducting income tax (£832 11s. 9d.), there remains a balance of £84,100 4s. 7d. A third interim dividend, amounting to £16,250, has been distributed since the last accounts were presented, leaving the sum of £67,850 4s. 7d. for appropriation. The directors now recommend the declaration of a final dividend of 2s. 6d. per share, free of income tax, making a total dividend of 5 per cent. for the year ending 30th June, 1879, which will absorb £16,250, leaving a balance of £51,600 4s. 7d. Of this amount £50,000 has been placed to the reserve fund, increasing that fund to £227,437 8s., and £1,600 4s. 7d. carried forward. Upon these figures he (the chairman) thought it was not necessary to observe at any great length. The report and accounts told their own tale. The object the directors had in view was to frame their report in a perfectly intelligible form so as to enable a comparison of one year with another to be drawn at a glance. The receipts of the past half-year, compared with the corresponding half-year of 1878, showed an increase of £5,000. But it should be remembered that the war in South Africa had brought grist to the mill, and they had carried a considerable amount of news from Madeira. Added to this, there was also an increase of 15 per cent. in ordinary messages. The speaker then referred to the unfortunate agreement which existed between this company and the Western Brazilian Telegraph Company, but with the assistance of the legal adviser of the board he hoped to be able to mitigate the evil of this unfortunate agreement. If they succeeded in getting rid of that agreement the profits of the company would largely increase. It would also be

seen that there had been a considerable reduction in the normal expenses of the company, the percentage of the working expenses on the earnings being 15½ per cent. The cables continued in good working order, and were carrying traffic as well as possible. The reserve fund was growing, but until it reached a sum much larger than the present amount it would, in his opinion, be very unwise not to lay by every penny after the payment of the dividend of 5 per cent. The chairman concluded by formally moving the adoption of the report and accompanying statement of accounts. Sir James Anderson seconded the motion. Several shareholders, amongst whom were Mr. Warwick, Mr. Jenner, Mr. Holdsworth, Mr. Marcus, Mr. Griffiths, Mr. Nates, and Mr. Spicer, raised objections to carrying so large a sum as £50,000 to the reserve fund, whilst only paying a dividend of 5 per cent. Up to a certain point no doubt it was a wise policy to add as largely as possible to the reserve fund, but this surely was not to go on in perpetuity. In reply to these observations the chairman reminded the meeting that the reserve fund continued their property as much as the cable itself. This reserve fund was being laid by so that in case a new cable were required they might have the money at their back to replace it instead of being compelled to call in new capital, and thus render their 5 per cent. perpetual. Other companies laid by their reserve fund first, and divided what was left amongst the shareholders, whereas this company acted differently, securing in the first instance the 5 per cent. and handing over what was left to the reserve fund. At present they had barely enough to replace the shortest section of the cable. The cost of an entire new cable would be probably something between six and seven hundred thousand pounds. The resolution was then put from the chair and carried with four dissentients. The directors retiring by rotation and the auditors having been re-elected, Mr. Spicer moved a resolution to the effect "That the board be requested not to add more than £30,000 per annum to the reserve fund from this time." The motion, which was seconded by Mr. Murch, on being put from the chair, was declared lost, there being 20 for and 22 against. The proceedings closed with the usual compliment to the chairman.

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.—The Board of this Company have resolved upon the payment of an interim dividend of 5s. per share, being at the rate of 5 per cent. per annum for the quarter ending 30th September, 1879, such dividend to be payable on and after the 15th November, 1879.

THE Chairman of the Eastern Telegraph Company has received a telegram from Aden announcing the completion by the Telegraph Construction Company's ss. Calabria of the Mozambique-Zanzibar section of the cable from Natal to Zanzibar.

THE India-rubber, Gutta-percha, and Telegraph Works Company successfully laid the Caspian Sea Cable on October 14th. The same company have also completed the laying of the French Government Cable from Marseilles to Algiers. Another cable to Wexford is being made by them for the Postal Telegraph Department.

WE hear that the estimate for the New Zealand Cable sent in by the Telegraph Construction Company, has been accepted, but that company's steamer which it was intended should take out the cable having sailed, they now decline to abide by the terms of the said estimate. Offers for making and laying will therefore, we presume, be again required.

The following are the final quotations of telegraphs:—Anglo-American, Limited, 55-56; Ditto, Preferred, 80½-81½; Ditto, Deferred, 30½-31½; Brazilian Submarine, Limited, 7½-7⅞; Cuba, Limited, 7⅞-8¼; Cuba, Limited, 10 per cent. Preference, 15-16; Direct Spanish, Limited, 1¾-2¼; Direct Spanish, 10 per cent. Preference, 10¾-11¼; Direct United States Cable, Limited, 1877, 10½-10¾; Eastern, Limited, 8-8¼; Eastern, 6 per cent. Debentures repayable October, 1883, 103-106; Eastern 5 per cent. Debentures repayable August, 1878, 103-105; Eastern, 6 per cent. Preference, 12-12½; Eastern Extension, Australasian and China, Limited, 8¼-8½; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 106-109; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, ½-1½ pm; Ditto, registered, repayable 1900, 1-2 pm; German Union Telegraph and Trust, 7¼-7½; Globe Telegraph and Trust, Limited, 4¼-5¼; Globe, 6 per cent. Preference, 11-11½; Great Northern, 8½-8¾; Indo-European, Limited, 22½-23½; Mediterranean Extension, Limited, 2¾-3¼; Mediterranean Extension, 8 per cent. Preference, 9¾-10¼; Reuter's Limited, 9-10; Submarine, 225-230; Submarine Scrip, 2-2¼; West Coast of America, Limited, 1-1½; West India and Panama, Limited, 1⅜-1½; Ditto, 6 per cent. First Preference 7½-8; Ditto, ditto, Second Preference, 7-7½; Western and Brazilian, Limited, 3⅜-3½; Ditto, 6 per cent. Debentures "A," 98-102, Ditto, ditto, ditto, "B," 94-99; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 123-128; Ditto, 6 per cent. Sterling Bonds, 105-107; Telegraph Construction and Maintenance, Limited, 33½-34; Ditto, 6 per cent. Bonds, 106-108; Ditto, Second Bonus Trust Certificates, 2½-3; India Rubber Co., 12½-13; Ditto, 6 per cent. Debenture, 104-108.

TRAFFIC RECEIPTS.

Name of Co., with amount of issued capital, exclusive of preference and debenture stocks.	Anglo-American Co. £7,000,000.	Brazilian Sub. Co. £1,300,000.	Cuba Sub. Co. £160,000.	Direct Spanish Co. £116,379.	Direct U.S. Co. £1,213,900.	Eastern Co. £3,697,000.	Eastern Ex. Co. £1,997,500.	Gt. Northern Co. £1,500,000.	Indo-Euro. Co. £425,000.	Submarine Co. £338,225.	West Coast America Co. £300,000.	Western and Brazilian Co. £1,398,200	West India Co. £883,210.
	£	£	£	£	£	£	£	£	£	£	£	£	£
September, 1879	63,240	*10,935	3,000	1,121	21,080	39,369	25,980	18,775	... ...	11,911	725	11,719	4,178
September, 1878...	44,310	10,463	2,463	1,048	14,770	38,169	22,151	15,778	... ...	9,661	2,200	... ...	3,877
Increase	18,930	472	537	73	6,310	1,200	4,829	2,997	... ...	2,250	... ...	... ...	301
Decrease	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	1,475	... ...	... ...

* Four weeks only.